Far Western University
Mahendranagar, Kanchanpur
Faculty of Science and Technology

B. Sc. First Semester Physical Group

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: **Basic Chemistry I** F.M.: 100
Course No.: **CHM111** P.M.: 45%
Nature of Course: **Theory** Credit: 3
Level: **B. Sc.** Number of hours per week: 3
Year: **First**, Semester: **First** Teaching Hours: 45

(1). Course Description

The course intends to enable the students to be acquainted with the basic concepts of chemistry, in all three branches physical, organic and inorganic chemistry. Students will be familiarized with the fundamentals of chemistry of states of matter, atomic structure, periodic table and the hydrocarbons.

(2). Course Objectives:

The general objectives of the course are as follows:

- To acquaint the students with basic concepts of the chemistry of gaseous, liquid and solid states.
- To enable the students to understand the fundamentals of the elements, atomic structure, the periodic table and theperiodic properties.
- To enable the students to understand the basic chemistry of hydrocarbons.
- To enable the students to appreciate the importance of chemistry in day to day life and value the scientific method ofchemical research and investigation.

(3). Specific Objectives and Contents:

Specific Objectives	Physical Chemistry Contents
• Explain the differences between ideal andreal gases. • Describe the postulate of Kinetic theory ofideal gases. • Derive important Gas Laws based on kinetic gas equation. • Discuss the basic concepts of velocity ofgas molecules. • Describe different types of the speed ofgases as well as the collision parameters. • Discuss the reason behind the deviation ofideal behaviour of the gas. • Derive Van der Walls equation. • Describe critical phenomena of the gases. • Introduce the concept of liquefaction ofgases. • Enable the learners to acquire skill of solving numerical problems related to all gas laws.	**Unit I: Gaseous State (8)** Ideal and real gases; Ideal gas equation; The gas constant; The Kinetic theory of ideal gases; The Kinetic gas equation; Deduction of the gas laws based on kinetic gas equation (Boyle's law, Charles's law, Avogadro's principle, Graham's law of diffusion, Dalton's law); The velocity of gas molecules; Root mean square velocity; Average velocity; Most probable velocity; Average kinetic energy of gas molecules; Molecular interpretation of the temperature. The Maxwell-Boltzmann distribution; Maxwell distribution of speeds; Types of average speeds; Pressure of an ideal gas; Collision of hard-sphere molecule (collision diameter, collision frequency, mean free path, collision density); Deviation of real gas from ideal behaviour; Causes of deviations; Derivation of Van der Walls equation; Explanation of behaviour of real gas from Van der Walls equation; Other equations of state; The Virial equation; Boyle's temperature and Van der Walls constants, Critical phenomenon; Relation between Van der. Walls constant and critical constants. Liquefaction of gases (Linde and Claude processes); Refrigerator; Liquefaction of air.

□ Describe the molecular arrangement of the liquid. □ Discuss the different characteristics of liquid state such as density, diffusion, viscosity, surface tension, evaporation, boiling point, vapour pressure. □ Explain the methods of .determination of viscosity and surface tension. □ Discuss the applications of surface tension and viscosity.	**Unit II: Liquid State (3)** Liquid (classification and molecular arrangement); Liquid state (density, diffusion, viscosity, surface tension, evaporation, boiling point, vapour pressure); Determination of viscosity and surface tension; Applications of surface tension and viscosity.
• Explain the difference between crystalline and amorphous solids. • Explain the structure and properties of (metals, ionic crystals, covalent crystals	**Unit III: Solid State (4)** Classification (Crystalline and amorphous solids); Types of solids (metals, ionic crystals, covalent crystals, Van der Waals crystals) and their properties; Crystal structure; Unit cells and crystal systems; Bravais lattices; Cubic
and Van der Waals crystals. • Define and describe unit cells and crystal systems. • Illustrate and explain different types of cubic crystals. • Explain Bravais lattices and Miller indices.	crystals (simple, body centered and face centered cubic crystals); Miller indices.
Organic Chemistry	
□Explain the structures of alkanes and alkane isomers. □Explain IUPAC system of naming alkanes. □Describe the properties of alkanes. □Define the term conformation and discuss conformational analysis of the alkanes. □Explain the structure, IUPAC nomenclature and geometrical isomerism of cycloalkanes. □Discuss the factors affecting the stability of cycloakkanes. □Discuss the conformational analysis of cycloalkanes including mono- and disubstituted cyclohexanes and polycyclic molecules.	**Unit IV: Alkanes (5)** Alkanes and alkane isomers; Alkyl groups; Nomenclature of alkanes; Properties of alkanes; Conformations of ethane; Conformations of other alkanes; Cycloalkanes; Nomenclature of cycloalkanes; Cis-Trans isomerism in cycloalkanes; Stability of cycloalkanes; Conformations of cycloalkanes (cyclopropane, cyclobutane, cyclopentane and cyclohexane); Axial and equatorial bonds; Conformations of mono- and disubstituted cyclohexanes; Conformations of polycyclic molecules.
□Explain the structure, industrial preparation, uses, IUPAC nomenclature and geometrical isomerism of alkenes. □Discuss the Sequence Rule of E, Z designation. □Discuss the electrophilc addition reactions of alkenes in terms of mechanism and orientation. • Introduce the Hammond postulate and highlight its importance. □Explain different types of preparation and reactions of the alkenes.	**Unit V: Alkenes (6)** Alkenes; Industrial preparation and uses of alkenes; Calculation of degree of unsaturation; Nomenclature of alkenes; Cis-Trans isomerism; The Sequence Rule (the E,Z designation); Stabilty of alkenes, Electrophilic addition reactions; Orientation of electrophilic addition reactions (Markovnikov' rule); Carbocation structure and stability; The Hammond postulate; Evidence for the mechanism of electrophilic addition reaction. Preparation of alkenes; Addition of halogens to alkenes; addition of hypohalous acids to alkenes; Addition of water to alkenes (Oxymercuration and Hydroboration reactions); addition of carbenes to alkenes; Reduction of alkenes; Oxidation of alkenes (Epoxidation, Hydroxylation and Cleavage to Carbonyl Compounds); Radical additions to alkenes; Biological addition of radicals to alkenes.

• Explain the structure and IUPACnomenclature of alkynes. • Explain different types of preparation andreactions of the alkynes. • Introduce the role of alkynes in organic synthesis.	**Unit VI: Alkynes (4)** Alkynes; Nomenclature of alkynes; Preparation of alkynes; Reactions of alkynes (Addition of HX and X2); Hydration of alkynes; Hydroboration/Oxidation of alkynes; Oxidative cleavage of alkynes; Alkyne acidity and formation of acetylide anions; Alkylation of acetylide anions; Introduction to organic synthesis.
Inorganic Chemistry	
• Explain the Bohr model of atom and itssubsequent refinement. • Explain wave mechanical model of atom. • Enable the students to write electronicconfiguration of atoms. • Introduce the students withfundamentals of nuclear chemistry. • Explain the periodic law and the periodic table. • Discuss the periodic trend in the periodic table. • Describe the occurrence and principle	**Unit VII: Atomic Structure, Periodic Table and Elements (15)** Electronic stucture of the atom; Bohr theory; Improvement on Bohr theory; Wave mechanics; de Broglie's equation; Heisenberg's uncertainty principle; Schrodinger's wave equation (time independent); Physical significance of wave function, Normalization of wave function; Probability; Density pattern for hydrogen atom; Radial and angular wave functions; Radial distribution curves; Atomic orbitals in wave machanics; Orbitals (s, p, d, f orbitals); Charge cloud diagrams and boundary surface diagrams; Nodal planes; Quantum numbers and their significance; Energy levels in the hydrogen atom; Structure of atoms with many electrons; Radial penetration of the wave functions; The Aufbau principle; Hund's rule; The Pauli exclusion principle; Electronic configuration. The nucleus; Subatomic particles; Nuclear stability; Binding energy;
behind different methods of extractionand purification of metals from its ore.	Radioactivity; Natural and induced radioactivity; Half-life determination and nuclear reactions; Radioactive displacement law and radioactivity series. Periodicity of elements; The preiodic law and arrangement of elements in the periodic table; IUPAC system of Periodic Table; s, p, d and f blocks; Long form of Periodic Table; General properties of atoms- size of atoms and ions- atomic radii; Ionic radii; Covalent radii; Trends in ionic radii, ionization potential, electron affinity; Electronegetivity (Pauling, Mulliken, Alfred- Rochow definition); Oxidation states and variable valency; Isoelectronic relationship; Standard reduction potentials; Electrochemical series. The occurrence and isolation of elements, Factors influencing the choice of extraction process, Mineral benefication-pretreatment, Dense medium separation, Flotation process, Solution methods, Magnetic separation, Electrostatic precipitation, Thermal decomposition methods, Displacement of one metal by another, High temperature chemical reduction methods, Reduction by carbon, Reduction by metal, Self-reduction, Reduction of oxides by hydrogen, Electrolytic reduction in aqueous, non-aqueous and fused melts, Thermodynamics of reduction process-Ellingham diagram.

(4). Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**	**Viva-voce**	**Weightage**	**Mark**
End semester examination		Assignments	20%		Report and Presentation on any topic	50%	
(Details are given in the separate table at the end)	60	Quizzes	10%	20	Presentation	25%	20
		Attendance	20%		Viva	25%	
		Internal Exams	50%				

Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

(I).External evaluation:

End semester examination:

It is a written examination at the end of the semester. The questions will be asked covering all the units of the course.

External Evaluation (Viva):

After completing the end semester theoretical examination, viva examination will be held. External examiner will evaluate report/presentation & take viva exam and will do above mentioned evaluation. Students should make a small report by relating any of the studied topics in the subject to some application areas/examples. Reports can be made in groups. There will be an internal examiner to assist the external examiner. In this examination Students must demonstrate the knowledge of the subject matter.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

(II). Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment willbe seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

(5). Prescribed Texts:

1. S. H. Maron, C. Prutton, **Principles of Physical Chemistry,** Oxford and IBH Publication and Co., 1992.
2. John Mc Murry, **Introduction to Organic Chemistry**, Brookes/Cole, 2007.
3. J.D. Lee, **Concise Inorganic Chemistry**, 5th Edition, John Wiley and sons. Inc., 2007.

(6). Reference

4. F. Daniels, R. F. Alberty, **Physical Chemistry**, John Wiley & Sons, Latest Edition.
5. Gilbert. W. Castellan, **Physical Chemistry**, Narosa Publishing House, 1985.
6. R. T. Morrison, R. N. Boyd, **Organic Chemistry**, Prentice- Hall of India Pvt. Ltd., 2008.
7. J. S. H. Pine, **Organic Chemistry**, McGraw Hill International Edition Series, New York, USA, 1987.
8. F.A. Cotton, G. Wilkinson, C. Gaus**, Basic Inorganic Chemistry**, John Wiley & Sons (Asia) Pvt. Ltd., 2007.
9. D. F. Shriver, P. W. Atkins, **Inorganic Chemistry**, W. H. Freeman and Co., London, 1999.
10. B. R. Puri, L. R. Sharma , K. C. Kalia, **Principles of Inorganic Chemistry**, Shoban Lal Nagin Chand and Co., Delhi, India, 1996.

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Chemistry Lab I Credit: 1
Course No.: CHM111 Number of hours per week: 3
Nature of Course:
PracticalLevel: B. Sc.
Year: First, Semester: First

(1). Course Description

The course intends to enable the students to be skilful in the basic chemical laboratory techniques. Students will be introduced to scientific method of experimentation. Students will develop skill on performing an experiment, observing and recording results and judiciously interpreting the results.

(2). Course Objectives

The general objectives of the course are as follows:

- To enable students to perform experiments on liquid properties of matter.
- To enable the students to develop basic analytical skill on organic qualitative analysis.
- To enable the students to develop basic analytical skill on inorganic qualitative analysis.

(3). Specific Objectives and Contents

Specific Objectives	Contents
• Enable the students to undertake experiments on surface tension and viscosity and interpret the results obtained. • Enable the students to perform an experiment on Rast method to determine the molecular weight of an organic compound. • Enable the students to perform experiments on boiling point determination and melting/ mixed melting point determination. • Enable the students to perform experiments on foreign elements detection and test for aliphatic and aromatic nature in organic compounds. • Enable the students to purify organic compounds by means of crystallization, distillation, sublimation and filtration. • Enable the students to determine the functional groups according to the solubility of the compounds. • Enable the students to calibrate the volumetric kits and prepare standard solutions • Enable the students to perform experiments on acid- base and redox titrations.	**Physical Chemistry Content** 1. Determination of surface tensions of two liquids supplied with the help ofa Stalagnometer and interpret the result. 2. Determination of the viscosity of two liquids with the help of a Ostwald'sviscometer and interpret the result. **Organic Chemistry Content** 1. Determination of melting and boiling points of organic compounds. 2. Determination of mixed melting point. 3. Detection of N, S and halogens. 4. Test for aliphatic and aromatic nature of organic compounds 5. Purification of organic compounds by crystallization, distillation,sublimation and filtration. 6. Determination of functional groups present in organic compounds basedon solubility. **Inorganic Chemistry Content** 1. Calibration of volumetric kits: burette, pipette and standard flasks. 2. Preparation of Standard solutions. 3. Experiment on acid – base titrations; a. Estimation of HCl. b. Estimation of oxalic acid. c. Estimation of total alkalinity in a sample of water. **Experiments on redox titrations** a. Estimation of ferrous ammonium sulphate (permagnometry) b. Estimation of calcium (permagnometry) c. Estimation of $KMnO_4$ (iodometry)

(4). Textbooks and Reference Books

- David P. Shoemaker, Carl W. Garland, Joseph W. Nibler, **Experiments in Physical Chemistry,** 5th edition,

McGraw-HillBook Company, **1989**. (Latest Edition).

- B. P. Levitt, ed. **Findlay's Practical Physical Chemistry**, Longman, London, **1973**. (Latest Edition)
- J. N. Gurtu, R. Kapoor, **Advanced Experimental Chemistry** (Vol I – III), S. Chand and Co., New Delhi, India, **1989**.(Latest edition).
- B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatchel, **Vogel's Text Book of Practical Organic Chemistry**, 5th Edition, Person Education, **2005**.
- L. Shriner, R. C. Fusion, D. Y. Curtin, **The Systematic Identification of Organic Compounds, A Laboratory Manual**,John Wlley and Sons Inc, New York, USA , **1980**. (Latest Edition).
- N. S. Gnanapragasam, G. Ramamurthy, **Organic Chemistry – Lab Manual,** S. Viswanathan Co., Pvt., India, **1998.**
- **Vogel's Text Book of Inorganic Qualitative Analyses**, 4th Edition, ELBS, London, **1974**. (Latest Edition).
- Moti Kaji Sthapit, R. R. Pradhananga, **Experimental Physical Chemistry**, Taleju Prakasan, Kathmandu, Nepal, **1998**.
- K. N. Ghimire, M. R. Pokhrel K. P. Bohara**, University Experimental Inorganic Chemistry**, Quest Publication, Kirtipur, Kathmandu, Nepal, **2008**.

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: Calculus F.M.: 100
Course No.: MTH111 P.M.: 45%
Nature of Course: Theory Credit: 3
Level: B. Sc. Number of hours per week: 3
Year: First, Semester: First Teaching Hours: 45

(1). Course description

The course aims to acquaint the students with basic concept of Limit, continuity and derivative which is considered to be the cornerstone of Calculus. After in-depth study of these terms students will be able to understand the subject matter and find its applications.

(2). Course objectives

The general objectives of the course are as follows:

- To acquaint the students with basic concepts of limit, continuity and derivative.
- To enable the students to understand the applications of Differentiation and Integration.
- To enable the students to understand the application of integration in applied mathematics, physics and Biological sciences.

(3). Specific objectives and course contents

Specific objectives	Contents in Detail
• Explain the meaning of limit, continuity and derivative. • Clarify the concept of limits and continuity to understand calculus in better way. • Explain the equation of tangent to a curve at any point and then derive the equation for cartesian subtangent, subnormal and their length. • Define and derive the Arc length in Cartesian form. • Obtain the polar equation to a curve. • Enable to student knowing about the precise definition of pedal equation and able to derive pedal equations of same curves.	**Unit 1: Limit and Derivative (7 hours)** Rate of change and limits (Review) Calculating the limits using limit laws (Review) The precise definition of limits and continuity (Review) One sided limit and limit at infinity (Review) The Derivative as a function (Review) The Derivative as a rate of change (Review) Infinite limits and horizontal and vertical Asymptotes Tangent and Normal Equation of tangent to the curve at any point (Review) Cartesian subtangent, subnormal and their length Derivative of Arc length in Cartesian form Polar equations to curve Derivative of Arc length in polar form Pedal equation of some special curves
• Discuss the meaning of successive derivative of a function with notation. • Could be able to compute higher order derivative of some special functions. • Derive the Leibnitz theorem. • Discuss the applications of successive derivatives.	**Unit 2: Higher Order Derivatives (3 hours)** Successive derivatives of some typical functions Leibnitz theorem (with proof) Application of Leibnitz theorem
• Introduce the extreme values of a function of two or three variables with conditions. • Compare the difference between various Mean Value theorems. • Discuss the Taylor's theorem. • Differentiate between Taylors and Maclurins series. • Explain the concept of derivative to sketch the various curves. • Describe the concept of Derivative for obtaining solutions in optimization problems. • Explain the method for estimating a solution of an equation $f(x) = 0$ is to produce a sequence of approximations that approach the solution.	**Unit 3: Application of Differentiation (9 hours)** Extreme values of a function of two or three variables The Mean value theorems (Revision) Taylor's theorem with Cauchy's forms of remainder Taylor's series Maclurins series of trigonometric, exponential and logarithmic functions Applications of mean value theorems to monotonic functions and inequalities Curve sketching Applied optimization problems Newton's method

• Explain the difference between indefinite and definite integral. • Explain the properties of definite integral and use it for theeven and odd functions. • Discuss various cases of improper integral ad properties ofBeta and Gamma function.	**Unit 4: Integration** **(5 hours)** The definite integral (Review) The properties of definite integral Reduction formula
• Describe the method for obtaining reduction formula for thetrigonometric function of higher order.	Fundamental theorem of calculus Improper integrals
• To review the area between the curves. • Explain the derivation for volume of a solid of revolution and surfaces of solid of revolution. • Describe how the concept of definite integral canbe applied for moments of centre of mass. • Assess the applications definite integral in Physics,Engineering and Biology.	**Unit 5: Applications of Definite Integral** **(6 hours)** Area between curves (Review) Volumes and surface Arc length Moments and centre of mass Work Applications to physics, Engineering and Biology
• Discuss various problems that can be formulated mathematically as differential equation. • To prove an existence uniqueness theorem and determined all solution by explicit formula. • Discuss the non-homogeneous equation of the form y" + ay' + by = R and its solution obtained by operating with an operator L. • Describe the method of solving simple harmonic motion, Damped vibrations, Electric circuit, motion of rocket with variable mass.	**Unit 6: Differential Equations** **(7 hours)** Linear differential equation (Review) Some physical problems leading to first order linear differential equation Linear equations of second order with constant coefficients Existence of solution of the equation y" + by = 0 Reduction of the general equation to the special case y" + by = 0 Uniqueness theorem for the equation y" + by = 0 Complete solution of the equation y" + by = 0 and y" + ay' + by = 0 Non homogeneous linear equation of second order with constant coefficients Special method for determining a particular solution of the no homogeneous equation y" + ay' + by = R 6.5 Some geometrical and physical problems leading to firstorder equation
• Explain the algebraic and order properties of R. • Introduce the meaning of absolute value to solve manyproperties on R. • Explain the definition of l u b and g l b and its further uses tounderstand the suprimum and infimum of a set. • Describe the various applications of suprimum and infimumproperty.	**Unit 7: The Real numbers** **(8 hours)** Algebraic and order properties of R Absolute value and real line The completeness property of R Application of the suprimum or infimum property

(4). Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments	10%	40
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Term papers	10%	
		Mid-Term exam	40%	
		Group work	10%	
Total External	60	Total Internal	100 %	40
Full Marks 60+40 = 100				

(I). External evaluation

End semester examination: It is a written examination at the end of the semester. The questions will be asked covering all the units of the course.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

(II). Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- ☐ Lecture and Discussion
- ☐ Group work and Individual work
- ☐ Self-study
- ☐ Assignments
- ☐ Presentation by Students
- ☐ Term Paper writing
- ☐ Quizzes
- ☐ Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

(5). Prescribes Books and References

Prescribed Books

1. Apostol, T.M. (2011), Calculus (Volume I). IInd Edition. Wieley India.
2. Strauss M. J. , G. L., Bradley and K.J. Smith, (2007)., Calculus. (3rd edition) Dorling Kindersley (India) Pvt. Ltd,(Pearson Education), Delhi.
3. Thomos G. B. and R. L. Finney (2007, Calculus. Pearson Education, New Delhi.

References

1. Bartle G.R. and Donald R. Sherbert (2002), Introduction to Real Analysis, John Wiley and Sons, New Delhi.
2. Anton H,. I. Bivens and S. Davis (2002) Calculus (7th edition) John Wiley and Sons
3. Stewart, J., Calculus with early Transcendental Functions, (6th Ed) Cengage Learning India, Delhi.

FAR WESTERN UNIVERSITY
Faculty of Science and Technology

Course Title: **English Grammar and Composition** F.M.: **100**
Course No.: **C. ENG. 111** P.M.: **45**
Nature of Course: **Theory** Credit: **3**
Level: **B. Sc.** Number of hours per week: **3**
Year: **First**, Semester: **First** Teaching Hours: **48**

(1). Course Introduction

This is a compulsory English course for B. Sc. students irrespective of their major subjects. The course exposes the students to the basic grammar that they require in their day-to-day academic settings at the undergraduate level. The grammar is introduced in context through the texts and further practice is provisioned through exercises. The course also helps students sharpen their reading and writing skills through various texts and composition exercises. Additionally, the course will also introduce critical thinking skills and they will be given opportunities to practice those skills in class through a variety of texts and tasks.

(2). Objectives

General objectives of this course are to:

a) help students produce grammatically correct English
b) develop writing skills for the academic work at undergraduate level
c) expose them to the variety of reading texts
d) give them practice in writing exercises
e) introduce them to the academic vocabulary items used in academic settings
f) develop in students the ability to think critically

(3). Contents in detail with Specific Objectives

Specific Objectives	Contents in Detail
• Make sentences using appropriate tenses in speechand writing • Use modals in the correct syntagmatic patterns • Supply correct prepositions, adjectives and adverbs • Use the right verbs in the given contexts • Use conditionals, clauses, questions in the givencontexts	**Unit 1: Grammar** **(20 hours)** Tenses Modals Determiners pronouns and noun phrases Prepositions, adjectives and adverbs Verb structures Word formation Conditionals, clauses, questions, indirect speech Sentences and varieties of English
• Predict and preview texts using a variety of strategies • Read for main ideas • Read and comprehend different text types • Read for details • Locate specific information in texts • Use graphic organizer to comprehend the texts • Identify source of information	**Unit 2: Reading** **(10 hours)** Prediction and previewing skill Skimming skill Reading for comprehension Reading for details Scanning skill Reading strategies Reading sources
• Develop and analyze paragraphs of different genres • Plan and make outline for writing • Revise, edit and rewrite • Write summaries • Write personal response to the texts • Write different letters • Write different types of essays	**Unit 3: Writing** **(10 hours)** Paragraph writing Preparing outlines Process writing: plan, draft, revise, edit Summary writing Responding to texts Writing letters Writing essays
• Use dictionary to find meaning • Identify different types of information in the dictionary • Use academic words in their writing • Find appropriate meaning of new vocabulary	**Unit 4: Vocabulary** **(10 hours)** Using a mono-lingual dictionary Differentiate literal meaning and idiomatic meaning Learning selected words from the Academic Word List (AWL)

indifferent contexts	Guessing meaning in contexts Learning phrasal verbs
• Use phrasal verbs in the given contexts • Analyze the composition of words	4.6. Understanding the composition of words and phrases
• Explain ideas to demonstrate comprehension • Reflect on the ideas in the texts • Connect ideas across texts or readings • Relate personal experience to the topic • Synthesize information from texts and personalexperience • Evaluate experiences and events • Consider social responsibility on various levels	**Unit 5: Critical Thinking** **(5 hours)** Comprehension skills Reflection on the ideas in the texts Connecting ideas across texts or readings Relating personal experience to the topic Synthesizing skills Evaluating experiences and events Considering social responsibility on various levels

(4). Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments	10%	40
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Term papers	10%	
		Mid-Term exam	40%	
		Group work	10%	
Total External	60	Total Internal	100%	40
Full Marks 60+40 = 100				

(I). External evaluation

End semester examination: It is a written examination at the end of the semester. The questions will be asked covering all the units of the course.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

(II). Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroomdiscussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- ☐ Lecture and Discussion
- ☐ Group work and Individual work
- ☐ Self-study
- ☐ Assignments

- ☐ Presentation by Students
- ☐ Term Paper writing
- ☐ Quizzes
- ☐ Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

(5). References

1. Gramer, M.F. and Ward, C. S. (2011). Q: Skills for Success (Reading and Writing) – 3. New York. Oxford University Press. *(All Units)*
2. Lloyd, M. and Day, J. (2011). Active Grammar, Level 3. Cambridge. Cambridge University Press. *(Unit I)*

(6). Dictionary

Hornby. A.S. (2010). Eighth Edition. Oxford Advanced Learner's Dictionary. Oxford: Oxford University Press.

FAR WESTERN UNIVERSITY
Faculty of Science and Technology

Course Title: Fundamentals of Environmental Science Course No.: ENV 111

Nature of the Course: Theory Level: B.Sc. (Undergraduate) Year: First,

Semester: First

Total Credit: 3

Instruction hours/week: 3

1. Course Description

The course intends to provide basic theoretical and practical knowledge on Fundamental aspects of Environmental Science. The course has been divided into five units. The first unit deals with Concept, development and scope of Environmental Science. The second unit focuses on Ecology, its associated components and Microbial Ecology. The third unit deliberates basic knowledge on Population and Community Ecology and its application. The fourth unit put emphasis on Concept and types of ecosystem and Pattern of energy flow in Ecosystem. While the fifth unit focuses on interrelation between Environment and Human Society and use of sociological and anthropological knowledge and practices on environmental conservation.

2. Course Objectives

The general objectives of the course are as follows:

- To acquaint the students with fundamental aspects of environmental science.
- To familiarize with environment and environmental science
- To give knowledge on ecology and ecosystem
- To develop analytical skills on Population and community analysis.
- To make familiar about the human interaction with environment

3. Specific Objectives and Contents

Specific Objectives	Contents
• Provide knowledge on concept, historical development, Scope and importance of Environmental Science. • Familiarize with environmental science and its interrelation with other disciplines.	**Unit 1: Environment and Environmental Science 5 hrs** Definition, concept and perspectives; historical development; objective, scope and importance; relationship between environmental science with other disciplines; environmental science in Nepalese and global context

• Discuss about concept, branches and Scope of Ecology; relation between environmental science and ecology. • Describe about life supporting systems; ecological factors; limiting factors. • Explain about food chain, food web, trophic structure and ecological pyramids • Highlight on concept of niche and habitat • Discuss Distribution of microorganisms in the environment; characteristics of bacteria, cynobacteria, actinomycetes, fungi, algae and protozoan and factors affecting growth of microorganisms. • Provide Knowledge on microbial interaction and concept of bioremediation and biosensors.	**Unit 2: Ecology** **10 hrs** Ecology: Definition, preview, branches and scope of ecology; relationship between ecology and environmental science; concept of ecosystem; life supporting systems; ecological factors; limiting factors; laws of limiting factors; ecological basics: terminologies, concept of food chain, food web, trophic structure, ecological pyramids; concept of niche and habitat Microbial Ecology: Distribution of microorganisms in the environment: bacteria, cynobacteria, actinomycetes, fungi, algae and protozoan; factors affecting growth of microorganisms; air, water, soil and food microbes; microbial interaction; concept of bioremediation and biosensors; microbes and human health, Use of microbes as biofertilizer and biopesticides.
• Describe Characteristic of population; theory of population growth and population dynamics. • Discuss the concept, characteristics and structure of communities. • Develop analytical skills on Population and community analysis. • Explain the meaning of Species interaction; explain their types with examples and their importance.	**Unit 3: Population and Community Ecology** **10 hrs** Population: Basic concept of population ecology; population characteristics; theory of population growth; population dynamics; population regulation. Community: concept, brief history, characteristics and structure; species interaction: positive and negative; linkage population, community and environment

• Explain the concept, meaning and different types of ecosystem. • Describe characteristic features and components of ecosystems. • Highlight the structure and functional aspects of pond and forest ecosystems • Describe the meaning and mechanism of biogeochemical cycle. • Discuss about the Energy flow process on ecosystem and its role in ecological balance. • Explain meaning and concept of succession and trend of succession. • Describe different types of productivity and its measurement techniques.	**Unit 4: Ecosystem** **15 hrs** Ecosystem: concept and types; terrestrial and aquatic ecosystems; structure and functional aspects of pond and forest ecosystems; biogeochemical cycle: gaseous, sedimentary and hydrological; energy flow; succession; productivity: primary and secondary
• Describe about development of human civilization and their socio-cultural perspective regarding environmental resources. • Explain about nexus population growth and environmental degradation. • Discuss the use of sociological and anthropological knowledge and practices on environmental conservation. • Explain the meaning of environmental sustainability: approach and principles • Highlight the environmental world views and ethics.	**Unit 5: Environment and Human Society** **5hrs** Environmental resources and socio-cultural perspective; human civilization and resources; nexus population growth and environmental degradation; use of sociological and anthropological knowledge and practices on environmental conservation; environmental sustainability: approach and principles; environmental world views and ethics

Text Books :

1. Miller, Jr. G. T. (2003). *Living in the Environment*: Wadsworth Publication.
2. Odum, E. P. (1996). *Fundaments of Ecology*: Saunders Company, USA
3. Sharma .P.D. Ecological and Environmental. Rostogi Publication, India

References:

1. Cunningham, W.P & Cunningham, M.A. (2004). *Principles of Environmental Science: Inquiry and Applications,* Second Edition. Boston: Mc Grow Hill.
2. Kormondy, E. J. (1996). *Concepts of Ecology*: Prentice-Hall of India, New Delhi.
3. Odum, E. P. and Barrett, G. W. (2005). *Fundamentals of Ecology*, 5th Edition, Saunders Company, USA.
4. Richard T. (2008). *Environmental Science, Toward a Sustainable Future,* PHI (P)

Limited, India

5. Santra, S.C. (2004). *Environmental Science,* New Central Book Agency (P) Ltd. India.
6. Sharma .P.D. Ecological and Environmental. Rostogi Publication, India
7. Francis A. (1982). *Modern Sociological Theory: An Introduction,* Oxford University Press, New Delhi
8. Pelczar M.J. 2010. *Microbiology, An Application based approach***,** second reprint, 2010 ,Tata McGraw-Hill Co, New Delhi.

FAR WESTERN UNIVERSITY
Faculty of Science and Technology

Course Title: Fundamentals of Environmental Science

Course No: ENV 111
Year: First
Semester: First
Nature of Course: Practical
Total Credit: 1

Practical No.

1. Enumeration of floral and faunal diversity of terrestrial ecosystem
2. Measurement of population and community parameters: density, frequency, abundance, community composition, similarity index, species-area-curve, minimum number of sampling units, species diversity of vegetation and animals by quadrat method.
3. Measurement of primary productivity (using different methods)
4. Biological analysis of soil from grassland/cropland/forest ecosystems
5. Instrumentation and working principle: compound microscope, hot air oven, autoclave, incubator, biological safety cabinet, water bath and related instruments
6. Analysis of bacterial population (staining, enumeration)
7. Visit to nearby forest /grassland ecosystem to enumerate floral and faunal diversity
8. Visit to nearby health post/Municipality/DDC to assess the environmental administration and management system.
9. Visit to human settlement area for socio economic and cultural study and prepare a project report.

<u>Some major points related to aforementioned practical:</u>

1. Students have to carry out *one day field visit* to nearby national park/wildlife reserve for conducting practical number **1, 2, 7 and 9**. Since the field work is for complete academic purpose. For this purpose University will have to support students for necessary transportation cost. Total two separate field visits will be held. First field visit will address practical number 1, 2, 7 and second field visit will address practical number 9.

2. Students have to prepare a field report for practical no. **8 and 9** and submit during practical examination.

3. Students have to submit a field note book of all field visits during practical examination.

FAR WESTERN UNIVERSITY

Faculty of Science and Technology

Course Title: **Information Technology Fundamentals** F.M.: **100**
Course No.: **COM. 111** P.M.: **45**
Nature of Course: **Theory** Credit: **3**
Level: **B. Sc.** Number of hours per week: **3**
Year: **First**, Semester: **First** Total Hours: **45**

(1). Course Introduction

Fundamental concept of Information technology, Computer systems, computer hardware and Software, input, output and storage devices, Binary system, programming languages, Data files and DBMS, fundamental concept of telecommunication, networking and internet and application of computer systems.

(2). Objectives

This course introduces fundamental concepts of Information Technology and Computer Systems.

(3). Contents in detail with Specific objectives

Specific Objectives	Contents
• What is data and information? • Describe processing cycle. • Describe what is hardware and software. • Understand the evolution of computers, from refining of abacus to supercomputers. • Understand the advancement in technology that has changed the way computers operate, efficient, size, and cost. • Classify different computers, networks, software's • Understand computer programming languages • Classify different programming languages • Understand the purpose of programming languages, facilities and various common examples.	**Unit I: Computer Concepts (4 Hrs)** Ideas of Information, Information Processing and Data. The Data Processing Cycle. Examples of computer applications. Definition of Hardware; broad classes of computers (mainframe, mini and microcomputers) and networks. Computer programs. The computer as a programmable device. Classes of software (system and application). Programming languages: purpose, facilities and common examples.
• Understand the basic units of computer system (Anatomy of a Digital Computer) • Understand how the basic digital computer is organized • Describe the purpose of basic units of computer systems.	**Unit II: Computer Hardware (4 Hrs)** The Central Processing Unit (Control Unit, Arithmetic and Logic Unit, Main Memory). Peripherals. The organization of a simple computer. The storage of programs and data. Data and Control paths in the computer (buses or highways). The Fetch- execute Cycle.
• Learn about the digital symbols, base. • Understand with the coding schemes for the internal storage of characters. • Understand what are on-line and off-line peripherals and data. • Understand what is verification and validation of data.	**Unit III: Data (2 Hrs)** Its Representation and Input: The Stages (collection, Preparation, verification, input methods). Input Devices and Media. On-line and Off-line peripherals. Verification and Validation methods.
• Familiarize with the various types of input devices along with their advantages, disadvantages, and applications.	**Unit IV: Input Devices (2 Hrs)** Description of common input devices and media (such as keyboards, light pens, mice, magnetic stripe readers, punched media, magnetic and optical character recognition, mark readers...), including simple physical principles of operation and practical applications.

• Familiarize with the various types of output devices to get desired result that may be in various from viz text, graphics, audio, and video; along with their advantages, disadvantages, and applications.	**Unit V: Output Methods, Devices and Media (2Hrs)** Description of Displays, Printers, Plotters and Computer Output on Microfilm, including simple physical principles of operation and applications.
• Understand the purpose of memory. • Familiarize with the different category of memories, units of storage, access time. • Discuss various types of primary and secondary memories with their storage organization.	**Unit VI: Computer Storage (4 Hrs)** Levels of storage: register, main and backing store. Units of storage (bytes and words) and capacities (Kbytes, Mbytes, Gbytes and TBytes). Definition of Access Time. Principles of construction of magnetic tape drives, magnetic disc drives (floppy and hard drives), CD-ROM and DVD; recordable and rewritable compact discs: CD-R and CD-RW.
• Learn about the binary number system and its advantages. • Representation of various number systems, methods of number system conversions. • Specify the rules to perform four principle arithmetic operations- addition, subtraction, multiplication, division of binary numbers with the help of suitable examples • Define two types of real numbers viz. fixed point representation, floating point representation; within floating point(non-normalized and normalized) and their representations in computer memory • Understand truth table and half-adder and full-adder operations	**Unit VII: The Binary System (5 Hrs)** Reasons for employing binary in a computer. The advantages and disadvantages of binary. The binary representation of numbers, characters and program instructions. Octal and Hexadecimal forms. Conversion between decimal, binary, octal and hexadecimal integers. Binary addition. Arithmetic overflow. Boolean logic. Simple AND, OR and NOT functions in two and three variables. Truth Tables. Half-adder and Full-adder logic. Logic diagrams.
• Discuss the prominent concepts to natural languages and computer languages. • Acquaints with the different generations of programming languages with their advantages and disadvantages • Elaborates the stages required during translation process (HLL, Assembly language to machine code). • Understand the concept of visual programming language and platform independent. • Outlook on the basic role of operating system in modern day computers; • Learn about the different types of operating systems; • Provide an overview of UNIX/LINUX operating system.	**Unit VIII: Programming Languages (7 Hrs)** Ideas of generations of programming languages: fourth generation (4GL), third generation ('high level'), assembly and binary machine code. Suitable applications for each level; comparisons between the levels. Translator programs - compilers, interpreters and assemblers; source code and object code. The concept of 'visual' languages. Java and the platform independence of its programs. The concept of operating system, functions of operating system, component of operating system, types of operating system. An overview of UNIX operating system.
• Understand the concept behind database, file, record, field and character. • Understand different types of data files and access methods.	**Unit IX: Data Files (4 Hrs)** Definitions of file, record, field and character. The concepts of file organization file access and file processing (updating). The main types of data file such as master and transaction. Serial, sequential and indexed sequential organization. Direct access and serial access. Updating sequential (tape or disc) files and indexed sequential files. Concepts of a simple database.

• Explain the computer related terms, communication networks, and flow of information through different forms of channel. • Understand the concept of serial and parallel transmission, different transmission modes.	**Unit X: Simple Telecommunications (4 Hrs)** Serial and Parallel transmission compared. Simplex, Half-duplex and Duplex modes. Modems and Multiplexors. Simple Interfaces. Character Codes. Basic communications facilitiesand the concept of bandwidth.
• Understand the various applications of computer systems in different organizations in terms of purpose, hardware, data, processes, outputs,advantages and limitations.	**Unit XI: Common Applications of Computer Systems (4 Hrs)** Non-technical descriptions (purpose, hardware, data,processes, outputs, advantages and limitations) in banking, education, engineering, police, hospitals, credit reference, meteorology, airline reservation and stock control.
• Describe computer networks and its various types. • Discuss various computer network topologies.	**Unit XII: Networking and the Internet (6 Hrs)** Concepts of Local Area Networks, Wide Area Networks and
• Understand the concept of WWW, Internet in termsof their uses, advantages and disadvantages. • Learn about the different browsers and its uses. • Learn various internet application viz email, FTP. • Understand fundamental concepts of HTTP and itsuses.	the Internet. Computer network topologies. The World Wide Web: the concept, its uses and possible disadvantages. Internet Service Providers. Web pages: construction and access; the role of Hypertext Markup Language (HTML) and Java. The concept of electronic mail and its basic uses. The basic functions of browsers.

(4). Evaluation System:

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	10%	20	Practical Note copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	10%		Experimental	50%	
		Presentation	10%				
		Term papers	10%				
		Mid-Term exam	40%				
		Group work	10%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

(I). External evaluation:

End semester examination:

It is a written examination at the end of the semester. The questions will be asked covering all the unitsof the course.

External Practical Evaluation:

After completing the end semester theoretical examination, practical examination will be held. External examinerwill conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination.Failed student will not be eligible to appear in the end semester examinations.

(II). Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignmentwill be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- ☐ Lecture and Discussion
- ☐ Group work and Individual work
- ☐ Self-study
- ☐ Assignments
- ☐ Presentation by Students
- ☐ Term Paper writing
- ☐ Quizzes
- ☐ Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

(5). Recommended Books:

- ☐ Longmans , **Glossary of Computing Terms, British Computer Society,** ISBN 0582-36967-3 or ISBN 0582-47594-5
- ☐ C S French , **Computer Science,** Fifth edition; Continuum; ISBN 0-8264-5460-7
- ☐ Geoffrey Knott and Nick Waites, **Computing**, Third edition; Business Education Publishers; ISBN 1901-888215
- ☐ Capron and Johnson, **Computers: Tools for an Information Age**, Eighth edition; Prentice Hall; ISBN 0-13-122723-8
- ☐ Ray Bradley; Stanley Thornes, **Understanding Computer Science,** ISBN 0-7487-4046-5
- ☐ Alexis Leon, Mathews Leon, **Fundamentals of Information Technology**, Leon TechWorld
- ☐ V. Rajaraman, **Fundamentals of Computers.**

FAR WESTERN UNIVERSITY
Faculty of Science and Technology
Physics I Semester

Course Title: **Mechanics**	Credit: **3**
Course Code: **PHY 111**	Number of hours per week: **3**
Nature of the Course: **Theory**	Total hours: **45**
Year: **First**, Semester**: First**	Full Mark: **100**
Level: **B.Sc.**	Pass Mark: **45**

(1). Course Description

The course intends to enable the students to be acquainted with the basic concepts of mechanics in Physics. Students will be familiarized with the fundamentals of Laws of motion, Motion under a central force, Gravitational Field and Potential, Rigid Bodies, Elastic Properties, Fluid Mechanics and Simple harmonic motion.

(2). Course Objectives

At the end of this course the students should be able:

- to acquire sufficient basic knowledge in Mechanics
- to apply this knowledge base for studying major courses in physics.
- to solve mathematical problems in related topics.
- to deduce mathematical equations and formulas.

(3). Specific Objectives and Contents

Specific Objectives	Contents
• Explain the differences betweeninertial and noninertial frames • Derive and describe the Newton'slaws of motion • Describe the dynamics of particlein rectilinear and circular motion • Distinguish conservative and Non-conservative forces • Describe various conservationlaws of mechanics • Explain the motion of variablemass (rockets) • Describe collision	**Unit I: Laws of motion (7)** Newton's laws of motion in inertial reference frame, Dynamics of particle in rectilinear and circular motion, Conservative and Non- conservative forces, Conservation of energy, liner momentum and angular momentum, Single-stage and multi-stage rockets, Collision in one and two dimensions, cross section
• Describe the nature of central forces and derive their equations • Explain two particle central forceproblem • Explain the methods of , reduced mass, relative and centre of massmotion • Understand and use law of gravitation and Kepler's laws to	**Unit II: Motion under a central force (6)** Central forces, Two particle central force problem, Reduced mass, Relative and centre of mass motion, Law of gravitation, Kepler's laws, Motions of planets and satellites, Geo-stationary satellites

describe the motions of planets and satellites	
• Describe a rigid body and its moment of inertia • Explain the difference between translation and rotational motion of a rigid body • Explain Euler's theorem and the Euler angles • Formulate equations and describe the motion of a symmetrical top • Explain and use the Coriolis effect	**Unit III: Rigid Bodies (7)** Rotational motion and moment of inertia, translation and rotational motion of a rigid body, Euler's theorem, the Euler angles, Motion of a symmetrical top, the Coriolis effect.
• Explain the elastic properties of material and the molecular theory • Explain small deformations and Hooke's law • Describe the elastic constants for an isotropic solid • Calculate and explain the bending of beams supported at both ends and Cantilever • Explain torsion of a cylinder • Describe bending moments and shearing force	**Unit IV: Elastic Properties (7)** Elasticity, Small deformations, Hooke's law; Elastic constants for an isotropic solid, beams supported at both ends, Cantilever; Torsion of a cylinder, bending moments and shearing force
• Explain the kinematics of fluid flow • Derive, explain and use continuity equation • Define and use Bernoulli's theorem • Explain streamline and turbulent flow and use Poiseuille's law for determining fluid properties • Describe the Reynold's Number • Understand the Stokes law	**Unit V: Fluid Mechanics (7)** Kinematics of fluid flow, Continuity equation, Bernoulli's theorem, Streamline and turbulent flow, Poiseuille's law, Reynold's Number, Stokes law
• Explain surface tension and its relation to the surface energy • Use molecular theory to describe the surface tension • Formulate the excess pressure on a curved liquid surface • Explain and formulate the capillarity action	**Unit VI: Surface Tension (3)** Surface Tension and surface energy, Molecular theory, Pressure on a curved liquid surface, Capillarity
• Derive and explain the differential equation of simple harmonic	

motion and its solution, • Understand the significance of complex notation • Distinguish damped and forced vibrations • Use formulations to explain the motion of various SHM: spring and mass system, simple, compound and torsional pendulums, Helmholtz resonator, coupled oscillators	**Unit VII: Simple harmonic motion (8)** Differential equation of simple harmonic motion and its solution, Significance of complex notation, Damped and forced vibrations, Examples: spring and mass system, simple, compound and torsional pendulums, Helmholtz resonator, coupled oscillators

(4). Evaluation System:

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	10 %	20	Practical Note copy	25 %	20
(Details are given in the separate table at the end)		Quizzes	10 %		Viva	25%	
		Attendance	10 %		Experimental	50%	
		Presentation	10 %				
		Term papers	10 %				
		Mid-Term exam	40 %				
		Group work	10 %				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

(I). External evaluation:

End semester examination:

It is a written examination at the end of the semester. The questions will be asked covering all the units of the course.

External Practical Evaluation:

After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

(II). Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of theassignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Suchquizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in thesession of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroomdiscussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructionaltechniques is as follows:

Lecture and Discussion

- ☐ Group work and Individual work
- ☐ Self study
- ☐ Assignments
- ☐ Presentation by Students
- ☐ Term Paper writing
- ☐ Quizzes
- ☐ Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

(5). Prescribed Texts

- Kittel, C., Knight, W. D., Ruderman, M. A. and Helmholz, A. C.,*Berkeley Physics Course, Vol. 1,Mechanics*, McGraw-Hill / Dev Publishers, New Delhi
- Mathur D. S., *Mechanics*, S. Chand (India) Pvt. Limited

(6). References

- Thornton S. T. and MarionJ. B., *Classical Dynamics of Particles and Systems*, Brooks/Cole
- FrenchP., *Newtonian Mechanics*, MIT Introductory Physics Series, Viva Bools Pvt Ltd
- HallidayD., ResnickR., Christman J. R. and WalkerJ., *Fundamentals of Physics*, Wiley
- SmithJ., *General Properties of Matter*, Radha Publishing House
- Feynman, R. P., Leighton, R. B. and Sands, M., *The Feynman Lectures on Physics*, Volume 1, NarosaPublishing House
- Landau L. D. and LifshitzE. M., *Mechanics*, Elsevier

FAR WESTERN UNIVERSITY
Faculty of Science and Technology

Four Years B.Sc.
(Physics)Course of
Study 2069

Course Title: Physics Practical Year: 1
Course No.: PHY 111 Semester: I
Nature of the Course: Practical Credit: 1

(1).Objectives:

By the end of the course the student should be able to:

- measure correctly the basic physical quantities
- determine errors in measurements
- analyze raw data and make valid conclusions
- validate corresponding theoretical component
- develop proper laboratory skills
- design basic physics experiments
- interpret experimental results and draw logical conclusions
- relate theoretical concepts to practical skills

(2).List of Experiments:

1. To verify laws of probability by throwing one coin, two coins and ten coins.
2. From given set of data, calculate the standard deviation, standard error and probable error.
3. By using method of least square, draw the best straight line through a set of given data points and findthe error in slope.
4. To determine the moment of inertia of a flywheel.
5. To determine the value of acceleration due to gravity at that place by using Bar Pendulum
6. To determine the Young's modulus of the material by bending beam method.
7. To determine the surface tension of liquid by Jaeger's method.
8. To determine of modulus of rigidity of wire by torsion pendulum/Maxwell's vibration needle.
9. To determine the coefficient of viscosity of water by Poiseulle's method.
10. Calibration of CRO for the measurement of voltage and frequency

Note:

- Student must perform 6 Hours of lab work (2 Hours x 3 times or 3 Hours x 2 times) every week
- In every semester, at least Eight experiments are to be performed. Additional experiments may be addedsubject to availability of time.
- The practical exam will be graded on the basis of the following marking scheme:In-Semester Evaluation 20 %
  Final Exam Written 60%
  Final Exam Oral 20%

(3). References:

1. Arora, C. L., B.Sc. Practical Physics, S Chand and Company Ltd.
2. Squires, G. L., Practical Physics, Cambridge University Press.
3. Shukla, P. K. and Srivastava, A., 2006, *Practical Physics,* New Age International (P) Limited, Publishers